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THE JOURNAL OF PHILOSOPHY
PSYCHOLOGY AND SCIENTIFIC METHODS

REASON AND COMMON SENSE

CRITICAL reason, especially the metaphysical brand of it, often runs counter to naïve reason, otherwise known as common sense. While this is no justification for rejecting the philosophical conclusion out of hand and absolutely, it is nevertheless a challenge to reexamine its grounds. Common sense has triumphed over some old scraps of philosophy, and it is rather likely to triumph over some that are not so old. It is time to sound a note of warning to philosophers not to be too reckless in flouting common sense.

Zeno thought he had proved that Achilles can not catch the tortoise; that, in fact, all motion is impossible; that all things are really at rest; that what we call motion is mere appearance. Common sense rebelled against such absurdities, and its verdict is now sustained by critical reason.[1]

Kant thought he had proved his antinomies, *i. e.*, that certain pairs of contradictories are both true. Critical reason now concurs with common sense in the conviction that, though Kant's theses and antitheses may in some fashion all be considered fairly demonstrable, it is only because they are to be understood in different senses. Contradictories can not both be true in the same sense.

Some vagaries of recent philosophizing stand a good chance to meet, at the hands of common sense and enlightened critical reason, the same fate that has befallen these older gems of metaphysical wisdom.

The starting post on the modern road to "astonish common sense" is the *point*. It has position only, but no extension. Hence we can pack millions of points in the tiniest space, like the devils dancing on the point of a needle in monkish philosophy. Points are tricky, too, like the imps aforesaid. Their unique quality of lacking extension, so that we can neither see them nor touch them nor hold them down to any sort of sensible ordinary behavior, makes them very slippery customers. We have to be careful how we talk about them. If one says that there are as many points in an inch as in a

[1] *Cf.* Spaulding, *The New Rationalism*, pp. 166–68. *Cf.* also Montague, *Studies in the History of Ideas*, pp. 245–48.

million miles, because the number is infinite in both cases, we can not conclusively deny it, though we may prefer the more cautious form, "there *may be* as many." The objection to the positive statement is that every positive assertion is a limitation, and an essential mark of the infinite is the absence of all limits. To say that the number is the same in both cases implies that we have "thought around" both infinites, encompassed them, bounded and determined them in thought so that we know they are equal. But whatever can be thus determined in thought is finite, not infinite. Hence it is inconsistent with the vague nature of infinity to say positively that there are as many points in an inch as in a million miles. "There may be as many," is not quite such a shock to common sense, and it is philosophically safer.

We can treat instants in the same way as points. An instant is a time-point. It has temporal position but no duration, just as a space-point has spatial position but no extension. We can therefore safely say that there may be as many instants in a minute as in a year, for the number is infinite in both cases.

But can we say that "there are just as many years in eternity as there are minutes"?[2] Years and minutes are in a very different category from instants; they are temporal units of measurement, and unlike instants *they have duration.* We can not juggle with them as we can with points and instants. Since there are some half million minutes in a year ($60 \times 24 \times 365\frac{1}{4} = 525{,}960$), common sense would say that in any period whatever, whether finite or infinite, the years must be multiplied by half a million or more in order to equal the minutes. Possibly in the long run common sense may get the better in this argument. The burden of proof in all fairness rests upon the bizarre assertion, and how is its author going about to prove it? If some great benefit were certain to accrue to mankind by the demonstration there would be more encouragement to undertake the task, but the profit to any mortal is far to seek. Lost souls might indeed be deluded with the hope of a shorter term if every minute counted off a whole year. Otherwise the utility of this time-scheme is imperceptible.

As for the method of proof there is of course that ingenious device much in vogue just now of setting up a one-one correspondence between two infinite series. In this case one series will be made up of years and the other of minutes.

[2] W. Curtis Swabey makes this assertion in his article, *Mr. Bradley's Negative Dialectic and Realism*, this JOURNAL, Vol. XVI., No. 15, p. 411. Bertrand Russell says that the *days* and years "in all time" are equal. (*Mysticism and Logic*, p. 91.)

1st y., 2d y., 3d y. ··· *ad infinitum.*
1st m., 2d m., 3d m. ··· *ad infinitum.*

As Bertrand Russell naïvely remarks, "There are obviously just as many numbers in the row below as in the row above, because there is one below for each one above."[3] It is true he was speaking of another case of one-one correspondence, but we have only to reverse "above" and "below" to adapt the remark to this case.

Now are the above infinites equal each to each, and both equal to the same eternity? Which eternity is meant, past, future, or the whole realm of Father Time, past, present, and future? Are these several eternities all equal, inasmuch as they are all infinite? Are all infinites equal? That point seems to be quietly assumed in setting up one-one correspondences running *ad infinitum.*

We are a bit suspicious of the soundness of this one-one proof. In the first place, asserting—or assuming—equality of infinites is inconsistent with the vague and indeterminate nature of infinity. But, in the second place, even if we ignore that objection, we have still to inquire in what respects infinites are equal. Those now under consideration are temporal infinites, year-and-minute infinites. Are they equal in actual duration or in the serial number of terms? The latter kind of equality is a necessary presupposition of the assertion that the years and minutes of eternity are equal in number. How then are they related in actual duration? The year-infinite looks as if it must be half a million times longer than the minute-infinite. Equality in actual duration of two infinites, the one made up of any number of years and the other of the same number of minutes, is a self-contradiction. But both must be equal to eternity —the same eternity too—to make good the assertion that the years and minutes of eternity are equal in number. And "equal to eternity" surely means equal in actual duration. Here then we have contradictory presuppositions of that bizarre assertion. Year-and-minute infinites must be equal in the serial number of terms, and they must also be equal in actual duration. The one-one proof is plump up against an *impasse.*

But some one may say, "infinites are infinites, just as pigs are pigs, and when you have run a series up to infinity there is nothing more to be said." Giving all due weight to that profound remark, still it is hardly to be supposed that any one would consciously and with grim determination maintain that all infinites are equal. That many do subconsciously assume it is evident. Let us see where that assumption would lead us. It would indeed be a fine scheme for proving anything we wish. Mill suggested that in some other world

[3] *Mysticism and Logic,* p. 86.

—evidently a fancy-free sort of a world—$2+2$ may for aught we know equal 5. But by assuming equality of infinites we can prove that theorem for our own prosaic world.

$$\frac{2+2}{0} = \infty; \frac{5}{0} = \infty.$$

If infinites are equal then

$$\frac{2+2}{0} = \frac{5}{0} \text{ and } 2+2 = 5.$$

Also we can prove that $1=2$.

$$\tfrac{1}{0} = \infty = \tfrac{2}{0}. \quad \therefore 1 = 2.$$

But instead of relying on an independent proof that the years and minutes of eternity are equal in number—a proof which limps painfully if indeed it gets on at all—suppose we simply fall back on our brand new definition of infinity. "The infinite is that which is in one-one correspondence with part of itself." The reasoning may possibly run somewhat in this fashion: Eternity is infinite, and *by definition* is in one-one correspondence with its years, also with its minutes; therefore the years are in one-one correspondence with the minutes; therefore the years and minutes are equal in number.

There is a double confusion of ideas in this kind of reasoning. Years and minutes, by reason of having duration as well as temporal position, can not be handled like instants which have no duration. The instants in any period, however brief, may be considered infinite, and that opens the door for one-one correspondences *ad libitum*. We are never brought up with a sharp turn by any shortage of instants. Not so with years and minutes. In a century-series the year-terms would be just 100 while the minute-terms would be $100 \times 525{,}960$. No possibility of one-one correspondence in that case. No amount of stretching will serve to make up for the shortage of years.

Another kind of confusion appears in the notion of one-one correspondence of eternity with either its years or its minutes. We must break up eternity into pieces of some sort in order to get a series representing the "whole." If the elements of eternity are taken to be instants, then years must be treated in the same way so that the "part" may be a "proper" part. We thus get a correspondence, but it is not the one we want—not eternity with years, but instants with instants. In fact there is no legitimate way to get the correspondence we want, either of eternity with its years or minutes, or years and minutes with each other.

In the case of some infinites the impossibility of a series representing the "whole" is obvious at once; the nature of the infinite in question distinctly resists and resents the conception of serial order. Divine compassion is infinite, but the idea of chopping it up into a series in order to set up one-one correspondence with part of itself, is ridiculous.

Of course we do not say, or imply, that any one has actually set forth in detail the line of reasoning sketched above for a possible application of the new definition of infinity; we are merely "supposing" a case. Yet it is highly probable that the new definition is in some vague way at the bottom of the conclusion that the years and minutes of eternity are equal.

Quite aside, moreover, from confusion of ideas in *applying* the new definition, there is another difficulty about this line of reasoning which is absolutely fatal to it. The new definition itself is based upon the same dubious assumptions and arbitrary forcing of serial relations in order to make out a specious appearance of one-one correspondence, which we have already found to involve absurd and impossible consequences. It is true that we may have a one-one correspondence of whole and part in the case of points and instants, but otherwise the correspondence fails, so that the definition is faulty in that there are many real infinites not in one-one correspondence of whole and part. This is conspicuously true of our next example of "astonishing common sense."

In the infinite series of whole numbers "there are *as many even* integers as there are *odd and even.*"[4]

The alleged "proof":

1, 2, 3, 4, ··· *ad infinitum.*
2, 4, 6, 8, ··· *ad infinitum.*

If this one-one correspondence is a sound proof in the case of even integers, we can extend its range indefinitely. Squares, cubes,

[4] Spaulding, *The New Rationalism*, p. 160. The same assertion "proved" in the same way, *i. e.*, by one-one correspondence, is found in numerous recent books and articles. It is one of the hall-marks of being up to date. William James is more cautious than other authors in his statements about integers. "Thus, in spite of the fact that even numbers, prime numbers, and square numbers are much fewer and rarer than numbers in general, they appear to be equally copious for purposes of counting." (*Some Problems of Philosophy*, p. 175.) Plenty of even numbers "for purposes of counting" is a proposition very different from "just as many even numbers as odd and even." But James immediately goes on to make his statement stronger. "Since every integer, odd or even, can be doubled, it would seem that even numbers thus produced can not in the nature of things be less multitudinous than that series of both odd and even numbers of which the whole natural series consists." We shall presently have a "look in" to ascertain the legitimate effect of this "doubling" process.

all sorts of powers or multiples, may be in like manner set forth in one-one correspondence with the whole series of natural integers.

$$1,\ 2,\ 3,\ 4,\ \cdots \textit{ ad infinitum.}$$
$$1^n,\ 2^n,\ 3^n,\ 4^n,\ \cdots \textit{ ad infinitum.}$$

The original assertion is sufficiently "astonishing" to common sense, but with high values of the exponent n the "astonishment" becomes fairly overwhelming. The numerical magnitude of the integers in the bottom row speedily passes clear comprehension. What sort of mental grasp can we have of the billionth power of a million? Yet, if the one-one proof is sound, there are just as many of these billionth powers as there are integers in the whole series, billionth powers included.

Is the one-one proof sound? A clear issue is joined, common sense *vs.* critical reason. Common sense says that the even numbers are only half of the whole series of integers; current philosophy teaches that they are equal to the sum of the odd and even, a part equal to the whole.

What is the meaning of *ad infinitum*? Both of the above series may be conceived as being continued till their last terms are both infinite, or till the number of terms in both is infinite. The first meaning is just as pertinent as the second—nay more, it is the one legitimate meaning, as we shall see in the sequel. But what follows its acceptance? At any point of equal numerical magnitude of last terms in both series, *e. g.*, 8, there are twice as many odd-and-even integers as even integers.

1, 2, 3, 4, 5, 6, 7, 8.
2, 4, 6, 8.

At the infinite point of equal last terms in both rows the same is true and common sense wins. It is only by ignoring the first meaning and assuming the second as if it were the only possible meaning of *ad infinitum,* that symbolists "prove" their case.

We can indeed, as James says, always double any term in the top row, and that *seems* to ensure the possibility of keeping the rows even. But *the double must also have its place in the upper row,* together with all lesser integers; for the top row must contain *all* integers. Thus it is continually running ahead of the lower row; its speed in the race to its infinite goal is just twice as great as that of the lower row if both series are developed in strict compliance with the conditions of the problem. No integer inserted in the bottom row can be omitted from the top row. But whenever we stop with the same number of terms in both rows—as symbolists always do in order to make a show of one-one correspondence—there will be terms

in the bottom row not found in the top row. Thus if we stop with six terms in each row, three of those in the lower row will be absent from the top row.

1, 2, 3, 4, 5, 6.
2, 4, 6, (8, 10, 12).

Of course if we thus leave out half of the odd-even series, *i. e.*, leave out 7, 8, 9, 10, 11, 12, it will be only equal to the even series, not its double. But instead of mutilating the odd-even series by leaving out a moiety of it, let us give it its just allowance of integers in full tale. When we balance 9 in the top row with 18 in the lower, we ought at once to write 18 in the top row also, and proceed to fill in 10, 11, 12, 13, 14, 15, 16, 17, in the gap between 9 and 18. The initial condition of the problem, *viz.*, the top row to contain *all* integers and the lower to contain only even integers, demands precisely that sort of genesis and development of the two series. This effectually *shuts out* the second meaning of *ad infinitum*, the sole basis, the absolute *sine qua non* of the anti-common-sense conclusion that the even integers equal the odd-and-even. Russell's naïve remark that "there are obviously just as many numbers in the row below as in the row above, because there is one below for each one above," is "obviously" true only when he, regardless of the plain conditions of the problem, has manipulated the series so that it must be true.

Here then is an actual infinite, the series of natural integers, which does not conform to the much-vaunted "new definition" of infinity. And this is by no means a solitary exception.

The new definition reverses, or attempts to reverse, the relation of finite and infinite. We used to think, and some of us still think, that the finite is the real standard of comparison, the known term of the couplet finite-infinite. It is determinate and positive in content; the infinite is the not-finite. Now the attempt is made to give the infinite a positive content and the finite is the not-infinite.[5] But after all is said and done it is the infinite that remains vague and indeterminate, so that definite assertions about infinites are risky. And it is precisely these risky assertions and dubious assumptions that underlie the conclusions adverse to common sense.

Passing beyond the rational determinate bounds of the finite is a plunge into the vague, the mysterious, the unknown. Infinity is not a standard entity of uniform extent or value, as it seems to be regarded in setting up one-one correspondence series running *ad infinitum*. It is indeed a broad mantle, but not quite adequate to cover all sins of omission or commission on the way to it or in the shadow

[5] "It then follows that a finite number is one that is not infinite." Spaulding, *The New Rationalism*, p. 453.

of its mystery. Some of the extravagant assertions about infinites seem to be mere mental pyrotechnics flashing out of murky depths like sky-rockets shot off in the dark. They need not be taken too seriously. Somewhat of that nature is the following: "From an infinite series any number of members can be taken, and to an infinite series any number can be added, without either increasing or diminishing it."[6] Now as regards the truth of this flash of inspiration—or *ignis fatuus*, whichever it may be—it is on all fours with the assumption that all infinites are equal. Once admit that this infinite may be greater than that, then it is not irrational to suppose that adding the difference to the less, or taking it from the greater, will in either case make them equal. We do not assert that result as a positive fact; we have to be careful how we talk about infinites. But the mere possibility of it subverts the *dictum* above cited. An instance of one infinite growing and another shrinking is right before our eyes—the eyes of the mind—all the time. Every added hour in the flight of time is an accretion to past eternity and a shrinkage of future eternity. That infinites can neither be increased nor diminished is, consequently, just one more risky assertion about infinites. At all events it has no such status of solid verity as to form a safe inferential basis for any other "astonishing" assertion about infinites. No use trying to prove by it that eternal years and minutes are equal, or that the even integers equal the odd-and-even. One risky assertion does not prove another of the same ilk.

The habit of indulging in sweeping assertions may usually be traced either to gross ignorance or pride of intellect. Sound scholarship tends to caution and moderation. Of all fields for exploiting a dogmatic temper the vague and boundless infinite would seem to be about the least appropriate. It might be thought alluring to some minds because of the difficulty of refuting their bizarre assertions about infinites. Such a consideration would be proper enough if it were always based upon solid conviction of the truth of their statements. But there may be a suspicion that they feel safe because they are operating in an elusive realm of vagueness and mystery. One of Russell's *dicta* tends to foster such a feeling of security—not intentionally of course. In the note on page 87 of *Mysticism and Logic*, he says: "Although some infinite numbers are greater than some others, it can not be proved that of any two infinite numbers one must be the greater." Hence, possibly, the complacency with which

[6] May Sinclair, *A Defense of Idealism*, p. 226. This is apparently not a hit from the author's own bat. Though not a direct quotation it is obviously based upon some one of the inspired *dicta* of Cantor or Russell. The inference therefrom, "that a finite series is not, in any sense, part of an infinite series," hardly needs a "mathematician" to reject it.

symbolists assume equality of infinites in order to make out a plausible showing of one-one correspondence. But that complacency is not well grounded. This inspired *dictum* that inequality of infinites "can not be proved," is just another example of risky assertions about infinites. *Reductio ad absurdum* has classical sanction as a method of proof, and we have shown above that equality of infinites involves the absurd conclusion that $1=2$. Thus its contradictory, the possible inequality of infinites, is fairly established. "All infinites are equal" is logically refuted by "Some infinites are not equal."

It is only points and instants that admit of genuine one-one correspondence between part and whole. Their amazing capacity for this trick is wholly due to the fact that points have no extension and instants no duration. A fancied analogy between them and units of measurement, spatial or temporal, such as feet and inches, minutes and years, has misled philosophers into the fallacy of illegitimate extension of the notion of one-one correspondence. They have ignored the fact that when we pass from unextended points to extended units, we are in quite another universe of discourse. The illusion is partly due to confusion of ideas in the familiar example of the points in one inch and one foot. A line a foot long is made up of two kinds of parts, extensionless points and extended units of measurement, and it is all too easy to get these mixed up in thought. An inch is a "proper part" of a foot, *i. e.*, a part like the whole in that it is an extended line. But the points in an inch are not a "proper part" of a foot; the extensionless is not like the extended. Although the inch is a "proper part" of the foot, feet are not, and can not be, in genuine one-one correspondence with inches, nor years with minutes. But some vague notion of such correspondence underlies the illegitimate extension of the one-one proof from points and instants to units of measurement, and leads to such conclusions as that the years of eternity equal the minutes of eternity. Those impish points and instants have played a sly trick on your learned and dignified philosopher.

The inaccuracy of the new definition of infinity is a serious matter, for infinites and one-one correspondence cut a great figure in current philosophical discussion. Indeed, not alone in the latest philosophical creeds but all down through the ages, the infinite, whether with or without specific definition, has been a word to conjure with.

L. E. Hicks.

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THE RELATION BETWEEN PHYSIOLOGICAL PSYCHOLOGY AND BEHAVIOR PSYCHOLOGY

IN theoretical discussions about psychological systems, the historical fact that there has always been an alternation in the emphasis, now placed on the physical and now on the mental aspects of human conduct, has been used as an argument to show that behaviorism merely represents the extreme swing of the pendulum when the interest in psychology is directed toward the physiological phase. From this point it is easy to glide into the aphorism "All extremes are bad" and the conclusion that "Therefore the *true* psychology lies somewhere between" can hardly be resisted.

While interest in the physiological aspect of traditional psychology undoubtedly contributed to the origin of behaviorism yet it is primarily the development in the natural sciences that were most effective in creating those differences that now exist in fundamental assumptions, in methodology, and in subject-matter, between physiological psychology and behaviorism, and which it is the purpose of this paper to describe.

Differences in Fundamental Assumptions

With respect to the fundamental assumptions underlying the mental and social sciences two questions may be asked:

1. Can the subject-matter be reduced to a single series of elements, or is it necessary to postulate a number of orders of elements between which no attributive similarities exist? If only a single series of elements is posited, we have a monistic system; if a number of existentially independent classes of components seem necessary for a complete understanding of the phenomena being investigated, we have a dualistic or a pluralistic system. The relation to a monistic or pluralistic theory of explanation is thus one of the first questions that may be asked about a mental or social science.

2. The second question concerns itself with the type of relationship that exists between those elements (or classes of elements) that represent the ultimate analysis of the subject-matter. This relationship may be either causal or non-causal, depending on whether there is or is not a quantitative identity or invariable sequence in the stages between successive events.

The pluralistic-monistic relation is considered first.

Physiological Psychology is based on Dualism.—Physiological psychology is defined as the science which investigates the correlations that exist between the structure of the human nervous mechanism and the phenomena of consciousness.[1]

[1] Ladd and Woodworth, *Elements of Physiological Psychology*, 1915, p. 3.

This definition clearly implies two existentially distinct types of facts, consciousness or mind, on the one hand, and the nervous mechanism, on the other. Consciousness is regarded as made up of those elements that are reported as present by a subject when a particular experimental method is followed. This method is usually characterized as introspection or self-observation and is relied upon for an analysis of mental complexes into elementary sensations, images and feelings. Just what experiences are to be included under these three terms, or whether these three classes are too many or too few has not yet been definitely agreed upon. There is, however, enough uniformity of opinion to warrant the use of the terms without an attempt at rigorous delimitation. Under the nervous mechanism the physiological psychologist includes those bodily structures whose function is that of sensitivity, conductivity and contractility.

As proof of the existence of the mental series the psychologist resorts to demonstration. A subject may be placed in such a position that the stimuli acting on the sense organs, and the actions that result, are reduced to a minimum. Under these conditions if the subject is asked what is going on in his mind he may report a wealth of imagery, feelings of pleasantness or unpleasantness far beyond what could reasonably be expected from a consideration of the magnitudes of the neural activity that either the subject or the experimenter can detect. Furthermore the subject will report that his imagery and feelings would have been practically the same whether he had actually reported them or not. When this experiment is repeated with other subjects the uniformity in the results approaches the limits regarded as adequate for any scientific observation and therefore the conclusion that there are mental processes in addition to neural processes seems justified. The dualistic character of physiological psychology finds its support in the assumption that the properties of the neural structures or processes are so different from the properties of the mental states or processes that they should be regarded as two different existential orders. A dualism made up of mental phenomena, on the one hand, and neural phenomena, on the other, is thus established.

Behaviorism is based on Monism.—For the behaviorist the mental series is regarded as only another neural series. He does not believe that the conclusion "there are mental states in addition to neural processes" is warranted from the experiment that is supposed to demonstrate the existence of mental states. All the experiment reveals is the fact that the sound waves that form the words of the oral stimulus "What is in your mind?" do not correspond in energy, properties, or duration to the energy, properties, or dura-

tion of the actions (introspections) that may be released. To say that the introspections reveal the existence of mental states is to infer the existence of a category of attributes (conscious elements) so dissimilar from those (sound waves and neural sensorimotor activity) upon which the inference is based, that its validity is doubtful. While in natural science it is quite common to infer the presence of some non-observed physical or chemical properties, yet such an inference does not violate the assumption that there is a mechanical equivalence between the successive stages in the process under investigation. Furthermore the traditional psychologist does not use the inference by claiming a causal relationship between the mental states and the behavior. If in the last analysis the attributes of consciousness can only be derived from the relation between stimulus and response the interpolation of a hypothetical conscious factor seems superfluous to the behaviorist.

Thus the "mere awareness of redness" of an apple for instance, instead of representing a separate conscious factor, represents merely a form of sensorimotor function in which neither the sense organs, the neural paths, nor the motor reaction (assuming that the awareness is not actually expressed as speech) can be localized or discriminated. That is to say "mere awareness" is a limiting condition arising from the fact that there are no sense organs in the nervous system, the adequate stimulus for which is the passage of a nervous excitation, or the changes in neurons that have been produced by previous function. The other limit is represented by the objective statement, "This is an apple," in which it is possible to discriminate the location of the receptors (eye) and the approximate position of the effectors (muscles of the speech mechanism or movements of the hand or arm). From this standpoint the mental and the physical, or the subjective and the objective, instead of being regarded as two separate entities, merely represent the minimum and maximum limits to which sensorimotor activity may itself be reacted to, or discriminated. It is in this sense that behaviorism is monistic.

The second question, the causal interrelationships between the elements may now be considered.

Physiological Psychology not a Causal Series.—The elements of physiological psychology may be studied in three types of relationship: (1) The relationship between the separate mental elements; (2) The relationship between the separate neural elements; (3) The reciprocal relationship between the mental and the neural elements.

1. Psychologists are fairly well agreed that the elements of the mental series do not form a causal relationship or series in the sense that there are any number of intermediate steps between the separate

elements or that the order in which they succeed each other is invariable. It is impossible to observe, for instance, the various stages by which one image is displaced by another, or to regard the succession as in any way maintaining a quantitative identity analogous to those physical energy transformations from which the concept of causality has been developed. The actual investigation of the mental series, as such, is restricted to that of cataloguing the conscious states or processes of those persons that have been specially trained in introspection. Mental states merely occur, and this is all that can be maintained.

2. The sciences of neurology and physiology supply the conceptions underlying the relationship between the neural elements. Both the physiological psychologist and the behaviorist are agreed that these relationships conform to the natural science concept of causation and it will not be necessary to discuss them further.

3. The third form of relationship that the physiological psychologist investigates is that existing between conscious processes and nervous function. The interest in the physiological aspect of psychology is merely an attempt to find some function (in the mathematical sense) of the mutually independent mental elements, that conforms to the natural-science concept of causation. The neural activity in the sensorimotor arch is regarded as such a function. This functional relationship between the mental and the neural elements is expressed by the statement: "Every psychosis has its neurosis." If the dualistic conception of mind and body is accepted there is much experimental evidence in verification of this hypothesis. However, it is not clearly enough recognized that when the concept of a psychosis, regarded as distinct from a neurosis, is introduced, causation in the biological sense vanishes. While few critical thinkers have ever maintained that the neurosis *produced* the psychosis or that the psychosis *produced* the neurosis, yet this is just the interpretation that is given by popular psychology and implicitly at least the conception is found in the writings of many professional psychologists.

If, on the other hand, the relationship between the mental and the physical is regarded as correlational only, the concept of causality must again be relinquished. Perhaps the clearest statement of the relation between the mental and the physical that indicates the standpoint of the physiological psychologists is that expressed by Warren,[2] who regards the mind as one aspect and neural function as another aspect of the same series.

[2] Warren, H. C., "The Mental and the Physical," *Psychol. Rev.*, 1914, XXI., 79–100.

Of the two forms of relationship that are investigated by physiological psychology neither one represents a causal relationship. The links of the mental series are not causally related; the mental-neural relation is correlational, not causal.

Behaviorism is a Causal Series.—To avoid the difficulties introduced by the mental-physical concept, the behaviorist avails himself of the generally accepted fact that whatever may be the properties of the mental series these properties can only be manifested or expressed by neural activity of some sort. For the behaviorist all activity is sensorimotor activity, whether this is of the simplest reflex type or the most complex actions that express man's intellect or character. Consequently, for the behaviorist the question as to the relation between mental and neural processes becomes merely the question as to the relation between two different forms of neural activity. These interrelations however form a causal series in that any number of transition stages may be observed and the properties of those neural processes from which the psychologist infers mental states differ only in degree from those sensorimotor conditions that make up habitual activity. Thus to have an image of an orange means merely that in addition to the sensorimotor activity appropriate to the occasion (eating breakfast for instance) there is also activity in those neural structures that functioned at a previous time when the subject reacted, to say the sight of an orange, by actually eating it. The same principles of sensorimotor function that explain the activity of eating, also explain the activity of imaging.

The postulation of a special mental process as distinct from the physical, the behaviorist regards largely as the introduction of a "thing in itself" concept. If neural activity alone can become available for science, why insist that there is "something else" which can never be directly observed or investigated? This of course does not mean that the behaviorist denies that a subject may introspect. He merely maintains that introspection is one of the many forms of sensorimotor activity by which the subject reacts to his environment.

For the behaviorist then there is only a single series, the elements of the nervous mechanism and the links between successive stages form a causal relationship.

Differences in Method

In the natural sciences it is of very little consequence whether the investigator adopts a monistic or dualistic interpretation of the mind-body problem. In the study of mental and social phenomena, however, the method of investigation and the results that are secured

depend largely upon whether the investigator supports a monistic or dualistic hypothesis. Such a problem for instance as "The Analysis of the Intellect" may not mean at all the same thing for the dualist that it does for the monist.

The Method of Physiological Psychology.—Since the physiological psychologist is primarily interested in the structure of consciousness, that phase of a problem will be emphasized that can be investigated by the method of introspection. To analyze intellect, for instance, the psychologist will ask a subject to reveal through introspection what mental states are present while he is performing some intellectual process, such as solving arithmetical problems, playing chess, *etc.* The stimulus conditions under which these introspections are made are carefully controlled and the result of the experiment is a classification of the introspective reports in such a way as to reveal certain patterns of consciousness. Such an investigation can be conducted with a degree of scientific rigor and ingenuity that may even exceed that shown in the investigations of many natural science problems, and the result secured may be regarded as just as complete a record of mental structure or mental function as for instance a systematic description of the flora of a country. To extend the conclusions derived from the individual introspective reports the experimenter repeats the experiment as often as may seem necessary. The explanatory phase includes an investigation of the neural structures and processes whose functioning is correlated with the introspective reports. The validity and generality of the conclusions that are reached depend on the skill and insight of the investigator as in any experiment in the natural sciences. The end result of an experiment in physiological psychology is a report of what patterns of consciousness may be expected to occur under given conditions.

The Method of Behaviorism.—The behaviorist has no special method in the sense that introspection may be regarded as a special method in structural psychology. In the problem "The Analysis of the Intellect" the approach is from an entirely different angle. Intellect is regarded as a form of sensorimotor activity rather than a form of consciousness and the first step in the analysis is to determine what type of activity is to be characterized as intellectual. The next step is to develop some technique by which the presence or absence of this type of activity can be detected, and finally its distribution in the whole or a selected part of the population is determined. This represents the social aspect of the problem. The behaviorist regards intellect or reason, judgment, *etc.*, as a form of behavior, not as a pattern of consciousness. From the individual

side the problem becomes that of tracing the development of those actions that have been defined as intelligent, from the earliest reflex activity of the infant to the final reactions of the adult. To assume that these reactions are accompanied by consciousness is no more helpful in an understanding of behavior than it is to assume that if we knew whether the atoms in a chemical reaction actually experience affinity, valence, warmth, cold, *etc.*, we could explain chemical reactions.

The behaviorist raises the question as to whether a subject who is introspecting is actually describing mental states. Instead of maintaining that introspection reveals the character of some mental process, it is simpler to say that it reveals only the fact that the experimental stimulus, in addition to producing the experimental response (pressing a key for instance) also produces an oral response (the introspective report). All that is actually observed is the fact that the energy of the response is not a simple function of the energy and character of the stimulus. The behaviorist regards introspection as the behavior of a very special and limited class of individuals. Human laws, institutions, social customs are developed by non-introspecting individuals, and it is the behavior of this type of individual that engages the primary interest of the behaviorist. While he may of course investigate the introspective reaction, he regards it as merely one way in which a psychologist may react to a special situation. The method of the behaviorist thus reduces itself to a statistical, genetic and mechanical analysis of those movements that form the basis of human interaction.

Differences in Subject-matter

The subject-matter of both physiological psychology and behaviorism in the final analysis, is human action and conduct. It is this fact perhaps that is largely responsible for identifying behaviorism with the neural aspect of traditional psychology. However, when the differences in methodology are taken into consideration the similarity in subject-matter is of no greater significance than the fact that the whole universe can be regarded as the subject-matter of mechanics or physics.

Subject-Matter of Physiological Psychology.—While selecting the form of behavior that is to be investigated, the physiological psychologist works toward establishing what mental states or processes are correlated with new or unanalyzed forms of action. The sensations, images, feelings, and emotions that accompany the manifold activities making up the life of the individual are regarded as presenting a field of investigation comparable in dignity and in the

demands upon ingenuity with that required in natural-science investigations. When in addition an attempt is made to determine what neural conditions accompany mental processes, the physiological psychologist maintains that he meets the descriptive and explanatory requirements that are regarded as constituting a science in the modern conception of the term. Mind and consciousness as revealed by introspection and as correlated with neural function represent thus the subject-matter of physiological psychology.

Subject-Matter of Behaviorism.—The development of behaviorism to some extent represents a reaction against the apparently meager achievement of physiological psychology. While certain neurological experiments may be interpreted as establishing the fact that certain mental states seem to be associated with either this or that part of the nervous system, yet as a matter of fact not even the simplest mental state or function can as yet be referred to a precise neural correlate. Singularly enough this fact is usually urged to show that behaviorism is impracticable and one-sided. While the behaviorist is of course interested in neural function, and even to a greater extent perhaps than the physiological psychologist, yet he is not merely a neurologist. His subject-matter is human behavior; those actions that are grouped under the general class names of intellect and character. In the study of these reactions a knowledge of the internal structure of the nervous mechanism is no more necessary than a knowledge of the internal structure of a molecule is necessary for a chemical analysis.

It is not clearly enough recognized that most of the experiments that are included under applied psychology, educational psychology, mental and social measurements, and even the classic memory experiment of Ebbinghaus are in reality investigations of human behavior. In these investigations no attempt is made to determine what mental or neural conditions are involved. An intelligence test, an educational test, a class examination, are merely different ways of measuring human action. Their social or scientific value in no way depends upon what assumption is made as to the presence or absence of mental or neural factors. The behaviorist's subject-matter includes a study of the stimuli and situations which act upon man, and a study of the reactions which result from the operation of these stimuli upon a nervous mechanism having certain acquired and inherited properties. What is acquired and what is inherited is not revealed by an anatomical or physiological analysis of neural function. Only the investigation of human action and conduct in its genetic developments can reveal this. The behaviorists maintain that aside from difference in anatomical structure the only differ-

ences between individuals is in the movements that they make and that these movements are to be studied in precisely the same way as any other movements, animate or inanimate. Human behavior is merely an expression of the fact that the chemical and physical conditions inside and outside the body are not in equilibrium.

The investigation of the internal neural conditions form part of the behaviorist's programme, of course, but the inability to trace the ramification of any given nervous excitation through the nervous system is no more a restriction on the study of effective stimuli and reactions in the educational, industrial or social phases of life, than is the physicist's inability to determine just what is going on in the electrolyte of a battery while a current is passing, a limitation that makes research in electricity impossible. Human behavior as a function of the environment and the nervous mechanism, represents thus the subject-matter of the behaviorist.

Summary

When compared with physiological psychology, behaviorism presents differences in fundamental assumptions, methodology, and subject-matter which do not justify the implication that behaviorism is merely an emphasis upon the neural side of physiological psychology.

The fundamental assumptions of physiological psychology are based upon a dualistic system, made up of mind on the one hand and neural function on the other, both of which are *correlated* with each other, but not causally related. The fundamental assumptions underlying behaviorism are monistic. The element is the reaction regarded as sensorimotor function of which the various stages are causally related.

The method of physiological psychology is that of introspection, supplemented by an analysis of the neural factors correlated with given mental patterns. The method of behaviorism is that of a statistical, genetic, and mechanical analysis of those movements that form the basis of human interaction.

The subject-matter of physiological psychology is mind or consciousness as revealed by introspection and as correlated with neural function. The subject-matter of behaviorism is human action and conduct regarded solely as a mechanical function of the environment and the reaction system.

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SPAULDING'S RELATIONS AND SUBSISTENT ENTITIES

SPAULDING'S *The New Rationalism* differs significantly from other neo-realistic books known to the writer by its detailed and critical discussions of non-realistic philosophical systems.[1] In truth, Professor Spaulding argues negatively for his own pluralistic and realistic conception of the universe by the attempted refutation of all other metaphysical conceptions. One and all, he holds, they presuppose a "true state of affairs" which is independent of any or all minds that know it—a state of affairs which is, in other words, only externally related to any knower of it. But such a state of affairs, Spaulding points out, is precisely the world as the pluralistic realist conceives it.

The present writer believes that Spaulding's argument for neo-realism—this argument by elimination of all non-realistic systems—is unsuccessful because of the incompleteness of his elimination—more specifically because of his failure to refute, or even to understand, what he calls "objective" (that is, numerically monistic) idealism which he treats as the doctrine of an extra-entity, mediating the relations of other entities outside itself, whereas it really is the doctrine of a complex, including entity which relates its own members. But this brief paper is not written in order to elaborate this fundamental criticism;[2] it has two less ambitious purposes (only loosely connected with each other): it seeks, in the first place to protest against Spaulding's identification of what he calls "the new logic" with metaphysical realism and, in the second place, it undertakes to disclose certain inherent inconsistencies and idealistic implications in Spaulding's doctrine of subsistent entities.

I. The new logic, by which Spaulding means the theory of relations, is, he holds (in agreement with others of his school) a necessarily realistic doctrine. For idealism, he contends, can admit the occurrence of those traditional relations only—substance, cause

[1] The seriously critical portions of the book, no less than its constructive sections, well repay the careful attention of students of philosophy. It is greatly to be wished that Professor Spaulding would either purge the book of its unnecessary repetitions or else indicate, in the Preface of a second edition, the sections and chapters which might be omitted, without detriment to the basal argument of the book.

[2] For exposition and criticism of Spaulding's main argument, *cf.* the writer's "The New Rationalism and Objective Idealism" in a forthcoming number of the *Philosophical Review*.

Besides argument the idealist finds in Spaulding's pages many unargued assumptions—in particular the reiterated assumption that a "true state of affairs" is *ipso facto* non-mental (pp. 86[1], 231[2], 369[2]) and the unmediated assertion that "knowledge presupposes something that . . . would be a fact were it not known" (p. 384[2]).

and inclusion—which are, to say the least, of subordinate significance; and idealism is consequently debarred from commerce with the truly important relations of series and order.[3]

Now, so far as the relation of self to objects is alone at stake, this account of the idealistic doctrine is, in the main, correct. The idealist conceives the self as inherently a relater of objects and not a merely related object; he therefore denies the externality of the relation known as consciousness, or knowledge. Accordingly the ultimate relations of idealistic philosophy are, in Spaulding's terms, "underlying" (pp. 38, 180 ff., 311 ff.) or "modifying" (pp. 37, 182 ff., 236 ff.)—relations of "substance" and of activity, or cause. But this admission falls short of a justification of Spaulding's position. There are in truth three important objections to his identification of the new logic with the new realism.

(*i*) In the first place, his procedure wholly ignores the position of the spiritualistic (or personalistic) dualist, who holds, with the idealist, that the knowledge relation neither exists nor subsists in independence of selves, but who may well agree with the realist that all other relations, save those of self to self and of self to non-mental object, are completely external to their terms.

(*ii*) The realist, in the second place, even if he is right in holding that external relations have no place in an idealistic metaphysic, is not thereby justified in excluding the idealist, in his capacity not of metaphysician but of logician, from the study of the relations of series and of order. For, as logician, the idealist might for methodological purpose adopt at will an impersonal attitude; he might regard all save personal objects *as if* related externally to each other. So regarding them, he would be free to deal precisely as the realist deals with the external and "functional" relations—for example, with the relations of series, symmetrical, asymmetrical or non-symmetrical; transitive, intransitive or non-transitive; finite and infinite; discrete and continuous. In a word, the relations of the new logic might be handled according to the strictest rules of the neo-logicians, as well by one who regarded classes and series as counters in a great game as by one who treated them as part of the coin of the realm of metaphysical reality.

(*iii*) The preceding paragraph has virtually argued that the idealist, in spite of his metaphysic, has a non-philosophical claim on the new logic. But in truth the idealist need not abjure or ignore his metaphysics when he turns to "logic." To be sure, he will inevitably, in his logical study, abstract from—be relatively inattentive to—the relation of objects to self; he will concern himself

[3] *The New Rationalism*, pp. 29 ff., 41, 243, 326. (Page references, unless otherwise indicated, are to this book.)

primarily with the relations of objects to each other. But he need not, therefore, regard these so-called external relations as metaphysically unreal; rather he may conceive the impersonal, external relations as implying the personal. So, for example, after the fashion of Stern, the idealist may hold that the alleged external relation of two terms with each other, presupposes that the two terms are still more ultimately, and directly, related to a self.[4] It is entirely irrelevant to the present purpose whether or not the idealist can successfully defend this view, whether, for example, he rightly holds that "two things external to each other can be related only in so far as both are included in a third as their common ground."[5] The point to be stressed is simply this: that the idealist, like the dualist, has a place in his system not only for the relation of self to its objects but for the "external" or "functional" relations of non-mental objects to each other. Obviously, therefore, the study of relations since it can be pursued as well by idealist and by dualist as by neo-realist, should not be harnessed up to one only of these metaphysical systems. To refuse a student who is not a neo-realist the right to concern himself with relations of series and order, is as if one should debar a man from singing Gregorian chants if he does not belong to the Greek church or from breeding guinea pigs if he is not a neo-Darwinian.

II. From this protest against the treatment of the new logic as an exclusively neo-realistic doctrine, I turn to my second topic: the discussion of the difficulties inherent in the theory of subsistent entities. This, however, demands a preliminary statement of Spaulding's doctrine as a whole. He conceives the universe as consisting of entities of two sorts: *existent* and *subsistent*. Of the existent entities, some are physical and some are psychical (p. 494). Physical existents include not only "things, forces, energies" (p 491[3]), living beings (p. 445[3]) and qualities, such as solidity and elasticity, but also "relations such as cause and effect" (p. 491[3]). All these would exist even if all the psychical existents were annihilated (pp. 384[3], 444 *et al.*). *Subsistent* entities belong to two main classes (p. 494): (*a*) "implied subsistents, discovered by reason;" (*b*)

[4] L. W. Stern, *Person und Sache*, a book most profitably read as companion-piece and offset to *The New Rationalism*. *Cf.* especially, pp. 39–40; p. 167[2]; the concluding section, pp. 345 ff., on "the deduction of the mechanical-impersonal relations from teleological-personal principles"; and the passage, pp. 255 ff., on the relation between causal succession and personal activity. (It should be added that Stern is more nearly a vitalist than an idealist and that his "person," the unique and complex totality of parts which it relates to itself and to each other, is conceived by him as psychophysically "neutral" and not as necessarily conscious.)

[5] Stern, *op. cit.*, p. 346[3].

"experienced but not implied subsistents; some spatial and temporal and some not." These last are once more subdivided into three subclasses, (1) " 'false' hypothetical entities, *e. g.*, phlogiston;" (2) "imagined entities such as centaurs;" and (3) "illusory and hallucinatory objects." And the "implied subsistents" of class (*a*) are likewise subdivided into (1) relations, classes, numbers, space, time; logical principles; series, infinity, and continuity; (2) "simples and complexes; terms and qualities;" (3) "ideal entities, contrary to existent fact." Like the physical existent, all these subsistent entities are entirely independent of the psychical existents, the selves or minds, and would continue though all minds, or knowers, ceased to exist (p. 492[2]).

Nobody can examine, with any degree of care, this classified list of the entities of the universe without being struck by the fundamental difficulty of the doctrine; its total failure to distinguish unambiguously between existent and subsistent entities. To be sure, Spaulding attempts to differentiate them. Subsistents, he once says, "lack . . . temporal and spatial localization"—whereas physical existents are both spatially and temporally localized and psychical existents "occur at certain specific times" (p. 492[2]). But in what he calls his "complete classification," quoted in condensed form in the preceding paragraph, he abandons this distinction by the explicit statement that not merely some of the experienced subsistents but some also of the "ideal" implied subsistents, are spatial and temporal. But if the *perpetuum mobile*, the satyr, and the contrast color (for example), though as truly spatial and temporal as the physically existent aeroplane and goat and lamplight, are none the less subsistent, evidently space and time quality can not serve to mark off the existent from the subsistent entities. And, in the end, Spaulding admits the dogmatic and unargued character of the distinction since he frankly states that, in differentiating the existent from the subsistent, "one must rely wholly upon the verdict of empirical methods and common sense in which innumerable things, qualities, events, and relations are accepted as existing" (p. 490[3]) and are contrasted with another group of entities which are "found to lack that full quota of qualities . . . which psychology and physics recognize as essential to objects that exist" (p. 492[2]). But this bare assertion of an empirical distinction between physical things and conscious minds on the one hand, and, on the other, a heterogeneous collection of relations, series, ideals, images, and illusions is not a philosophy, and least of all a new rationalism. At its face value it is merely the familiar spectacle of realism at bay, taking refuge in the rough distinctions of the "plain man." But it has not even the advantage of this naïvely

realistic position. For surely no scheme of classification can be much further from the "verdict of common sense" than one which groups together, even under its most general heading, so heterogeneous a manifold as logical principles, ideal beauty, space, phlogiston, and "the snakes of tremens" (p. 494), and which brings together in one of its sub-classes such sharply contrasted entities as ideal justice and a *perpetuum mobile* (p. 494).

The preceding paragraphs indicate the basal defect of Spaulding's doctrine of subsistent entities judged by its own standards. This which follows will suggest the idealistic implications of the doctrine. One of these is found at a point at which Spaulding certainly draws a real distinction between his two main classes of subsistents. The one class, that to which belong the relations, series, classes and ideals—is, he says, "implied," that is "discovered by reason." The other class—that which includes the false hypothetical entities, the illusions and the images—is "experienced." Here we have clearly an observed distinction—but in terms of consciousness; the contrast between the inferred and the imagined (as perceived). A further study of the tabular view of the "entities of the universe" (p. 494) discloses a more significant instance of this reference to consciousness. In the only passage in which Spaulding instead of enumerating existents and subsistents describes them, this description (which one may note, *en passant*, once more fails utterly to distinguish between the two) is again in terms of consciousness. Existents are said to be "perceived and inferred, remembered and imagined." And "non-existent subsistents also" are "perceived and inferred, remembered and imagined." These terms, it must be reiterated, are not casually used but constitute the basic descriptions alike of existents and of subsistents. Of course, the realist understands always, after "perceived" or "inferred," the word object; and always assumes that the object is or may be non-mental. But apparently he altogether overlooks the significance of the fact that his only *descriptions* of the lavishly enumerated existent and subsistent entities are in terms of the mental.

The consideration of the failure of the subsistent entities to justify their position in the metaphysical scheme of reality sets the reader to speculating on the psychological genesis of the doctrine. It is, in truth, not difficult to guess how neo-realists have been led to invent, or to adopt, the conception of entities at once non-physical and non-psychical. They have recognized the inadequacy of the old materialisms and dualisms—the too exclusive concern with sensuous objects and the crude disregard of relations, and "values." And at the same time they have rejected the idealistic account of these non-physical entities. Thus this world of the non-mental yet non-

physical entities has been forced upon them; and some of them have sought to enhance its actuality by appropriating for its use the term "subsistent." Since, however, as has just been pointed out, Spaulding never succeeds in defining the world of non-mental yet non-physical realities (unless in terms of consciousness) he can hardly hope by the repeated assertion of its non-mental character effectively to defend it against the assaults of the idealists, strengthened as they are, at just this point, by the adherence of those who, while they shy at pure idealism, none the less insist on the mental or ideal nature of all that does not belong to the world of the physical sciences.

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REVIEWS AND ABSTRACTS OF LITERATURE

Troubles Mentaux et Troubles Nerveux de Guerre. GEORGES DUMAS. Paris: Alcan. 1919. Pp. 225.

This volume claims more general interest than naturally attaches to a treatise on military psychiatry. It consists principally of articles contributed to the *Revue de Paris;* and has the quality of its origin, of precision without pedantry. It is concerned most with the neuroses, not the psychoses of war, the latter being briefly dismissed as not essentially characterized thereby. A following chapter takes up confusional symptom-complexes associated with physical or mental shock. Some interpretative stress is here laid on toxic factors. Interesting types of amnesia, and other accidents in motor and sensory fields, are exemplified with profuse clinical observation. Successive chapters are devoted to the organic and emotional features of war neuroses, as well as those in which suggestion by self or others is the chief factor. Organic factors are thought to be especially prominent in auditory disorders; a limited group of symptoms also is referred to "emotion which has become unconscious." Practical measures in suggestive therapeutics are described; mutism yields the most readily thereto. The rôle of electricity in these procedures appears to have been considerable. Symptoms responding to suggestive treatment are facilitated through increased suggestibility the direct or indirect result of shock. Attention is invited to the generally passive character of autosuggestive symptoms arising after shock, *e. g.,* paralyses as opposed to contractures. A following brief account of administrative experiences in military psychiatry forms the most interesting, even entertaining portion of the volume. Anaphylactic effects of shock are observed; there appears only the normal heredity for mental disease; on the other hand, previous emo-

tional instability is frequent. A final chapter deals with problems of simulation. In conclusion a succession of different types of symptoms of shock conditions is put forward as (1) physical and emotional shock, with their organic and mental sequelæ; (2) confusion, with its intellectual and affective features; (3) autosuggestion; (4) prolongation of symptoms, which grades into (5) simulation.

The volume contains searching analyses of organic and mental factors, that do not lend themselves to brief review. A striking feature is the slight if any trace of psychoanalytic influence. British military psychiatry seems to have been considerably affected thereby.[1] There is copious and dispassionate reference to cognate German literature of the war period.

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Neuroses et Psychoses de Guerre chez les Austro-Allemands. G. DUMAS, and H. AIMÉ. Paris: Alcan. 1919. Pp. 242.

This volume is more technical than the preceding, and bears more evidence of other than scientific issues between the groups at war. It is based on three reports by Birnbaum published in 1915 and 1916 in the *Zeitschrift für die gesamte Neurologie und Psychiatrie.* One meets not without regret in this connection such names as Binswanger, Jolly, Alzheimer, Weygandt, Westphal, Gaupp, and others quoted. Certain topics only are selected for discussion in the review by Dumas and Aimé; these concern chiefly the conceptions of *Schreckneurose,* traumatic neurosis and hysteria. Surprise is expressed at insufficient differentiation between hysteria and confusional states. Effects of the war's outbreak on the civil population are noted. Stransky discusses pathological indifference to danger. No special national immunity to war neuroses appears; it is on the side with the heaviest artillery. A few writers, notably Nonne, make special claims for the value of hypnosis. A discussion arising in German psychiatric circles out of Oppenheim's views on traumatic neurosis is dealt with in some detail. There is a brief note on war neurotic symptoms among animals, which seem to be clearly observed. The emphasis on toxic etiology noted in the other work is expressed also in this volume. German literature appears more inclined to psychogenic viewpoints, but these have had less influence even here than on corresponding thought in England and America, or been less appreciated by the French reviewers. Flight into the psychosis and unconscious determination are very casual conceptions for the text. There are many removes between the original German

[1] *Cf.* Rivers, W. H. R., "Psychiatry and the War," *Science,* N. S., 49, 367–369.

articles and American readers, and the book appeals essentially to the specialist as a résumé of German progress in these directions during the first half of the war.

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JOURNALS AND NEW BOOKS

PSYCHOLOGICAL REVIEW. July, 1919. *The Evolution of Behavior* (pp. 247–276): H. J. BAWDEN. – Natural selection is at present the only accredited theory of organic evolution. The beginnings of behavior, plant and animal life, early life on the seafloor, invertebrate and vertebrate, *etc.*, are traced. *The Principles of Serial and Complete Response as Applied to Learning* (pp. 277–286): RUTLEDGE T. WILTBANK. – The writer does not question the statements of Carr and Peterson, but he tries to show that in the case of the maze, insomuch as the successful movements must be made through the entire length of the runway while the erroneous movements need not be, and there is a constant tendency making for the shortening of the erroneous movements, the arcs involved in the successful movements must undergo greater innervation than any of the others. This, as already noted, seems to justify placing the principle of the completeness of the single successful movement on the same footing with frequency and recency as explanatory principles in maze-learning. It seems warrantable to assume that this principle holds in all learning by the trial and error method. *The Influence of Extraneous Controls in the Learning Process* (pp. 287–293): HARVEY CARR and HELEN KOCH. – This paper attempts a preliminary comparison of the rate of learning when all possibility of error has been eliminated by means of some extraneous control, as opposed to the usual procedure of learning by the trial and error process. No general conclusions are yet made, but investigation is now going on and a limited amount of control introduced at a certain stage of the learning is extremely effective in the mastery of the maze problem. *Multiple Choice Experiment Applied to School Children* (pp. 294–299): ELEANOR ROWLAND WEMBRIDGE and PRISCILLA GABEL. – Tests were designed as an application to human beings of the multiple choice methods of testing, suggested by experiments which Yerkes once tried on pigs, crows and monkeys. *Practise Effects in a Target Test—A Comparative Study of Groups Varying in Intelligence* (pp. 300–316): BUFORD JOHNSON. – An investigation was made for the study of the comparative practise ef-

fects in a motor test given to groups varying in intelligence as measured by standardized scales. The learning curves for the low and high groups are characterized by marked fluctuations and valleys rather than plateaus. These valleys occur at different stages of practise, indicating a differentiation of incentives for groups of varying levels of intelligence. The median group has the usual form of learning. While the data indicate the effectiveness of superior intelligence in the acquisition of skill in the target test, there is evidence of great capacity to improve in the upper grade mental defective. *Plotting Equations of Three Variables in Mental Measurements* (pp. 317–326): HERBERT A. TOOPS. – The possibility of using a series of curves to represent on ordinary plotting paper the variations of a dependent third variable of a mathematical equation is not well known. The ease with which some of the simpler equations used by a clinical psychologist can be expressed in charts would seem to recommend these charts for their use.

BRITISH JOURNAL OF PSYCHOLOGY. May, 1919. *The Psychological Interpretation of Sense Data* (pp. 261–280): JOHN LAIRD. – Psychologists must set themselves to explain precisely what is meant by sense presentations or sense data. It is not enough to point to examples. *The Unconscious* (pp. 281–298): CARVETH READ. – There is great difficulty in defining the unconscious. Repression and Unconsciousness as determined by organic structure, the concept of the unconscious, *etc.*, are discussed. *The Acquisition of Motor Habits* (pp. 299–320): VICTORIA HAZLITT. – A study of the acquisition of motor habits of rats in a maze is given. The results show that the rat is not a machine. *The Proof or Disproof of the Existence of General Ability* (pp. 321–344): GODFREY H. THOMSON. – The object of the paper is to investigate the significance of the coefficient of partial correlation, and to examine into the validity of some reasoning based on its use. There have been made sweeping deductions as to the presence of general ability in many forms of activity, based upon methods depending largely, if not entirely, on a similar misinterpretation of the methods of partial correlation. *The Hierarchy of Abilities* (pp. 337–344): GODFREY H. THOMSON. – The object of this paper is to investigate some of the ways in which hierarchical order can be produced among mental tests other than by the action of a hypothetical general ability. *General Ability, Cleverness, and Purpose* (pp. 345–366): J. C. MAXWELL GARNETT. – The object of this article is to show that, in addition to the "single general factor" which along with specific factors tends wholly to account for the correlations between any set of sufficiently diverse

mental tests, there are other independent factors which also enter to a sufficient extent into tests of certain groups of similar qualities. *Joint Note on "The Hierarchy of Abilities"* (pp. 367–368): J. C. MAXWELL GARNETT and GODFREY H. THOMSON.–The points on which the writers agree are given. *Publications received.*

REVUE DE MÉTAPHYSIQUE ET DE MORALE. March–April, 1919. *La "Pedagogie" de Rousseau* (pp. 153–180): É. DURKHEIM.–An abstract of the chief points of Rousseau's theory with supporting quotations from texts. *Émile Durkheim* (pp. 181–198): G. DAVY.–A biographical sketch. *La Dégradation de L'Énergie et le Principe de Carnot* (pp. 199–210): F. MICHAUD.–A criticism of M. Selme's paper on Entrophy. *Études critiques. La Métaphysique de Josiah Royce* (*Suite et fin*) (pp. 211–246): G. MARCEL. *Enseignement. La Technique de L'Education aux Universités et l'Enseignement national:* J. DELVOLVÉ. *Questions Pratiques. Réflexions sur le Droit de la Guerre:* R. Hubert.

Bridges, James Winfred. An Outline of Abnormal Psychology. Columbus, Ohio: R. G. Adams & Co. 1919. Pp. 126.

Taylor, Henry Osborn. Prophets, Poets, and Philosophers of the Ancient World. New York: The Macmillan Co. 1919. Pp. 294. $1.50.

NOTES AND NEWS

PROFESSOR ALIOTTA, of the University of Padua, is seeking to establish an International Philosophical Review which shall contain articles in Italian, English, French, German and Spanish, with the translation of a certain number of them into French. Professor Aliotta invites the collaboration of American students of philosophy in his very interesting enterprise.

PROFESSOR MORRIS R. COHEN, of the College of the City of New York, has been given leave of absence for the current academic year. Professor Cohen expects to devote his time to studying the philosophy of law.

DR. DANIEL STARCH, professor of psychology at the University of Wisconsin, is on leave of absence for the first half of the present year, and is giving a course of lectures at Harvard.

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Thomas Hobbes and the Apologetic Philosophy. C. E. Ayres.
Teleology and Pragmatism: A Note. Roberts B. Owen.
Pragmatic Teleology. Ethel E. Sabin.
Reviews and Abstracts of Literature. Journals and New Books. Notes and News.

Volume XVI. No. 19. September 11, 1919

The Function of Philosophy in Reconstruction. Alfred H. Lloyd.
The Concepts of Class, System and Logical System. F. Russell Bichowsky.
Note on the Relation of Subalternation. Henry Bradford Smith.
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Volume XVI. No. 20. September 25, 1919

The Definition of Logic. Harold Chapman Brown.
Purpose. Alvin Thalheimer.
Methodological Teleology. F. C. S. Schiller.
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Volume XVI. No. 21. October 9, 1919

The Anticipatory Aspect of Consciousness. L. L. Thurstone.
Relations between Relations. H. T. Costello.
A Reply to "The Defect of Current Democracy." Henry T. Moore.
The New State. H. B. Alexander.
Reviews and Abstracts of Literature. Journals and New Books. Notes and News.

Volume XVI. No. 22. October 23, 1919

Liberty and Reform. M. T. McClure.
Realism and Perception. James Bissett Pratt.
Pyschology and Scientific Method. Henry Heath Bawden.
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Subscription $1.25. 200 pp. Founded 1895. Edited by Madison Bentley.
An annual bibliography of psychological literature.

Journal of Philosophy, Psychology, and Scientific Methods—New York.
Sub-Station 84. Bi-weekly. 728 pages per volume. Founded 1904.
Subscription $3. Edited by F. J. E. Woodbridge and Wendell T. Bush.

Archives of Psychology—Sub-station 84, N. Y.: Archives of Psychology.
Subscription $5. 600 pp. ann. Founded 1906. Ed. by R. S. Woodworth.
Published without fixed dates, each number a single experimental study.

Journal of Abnormal Psychology—Boston: Richard G. Badger.
Subscription $5. 480 pages annually. Edited by Morton Prince.
Bi-monthly. Founded 1906. Entire field of abnormal psychology.

Psychological Clinic—Philadelphia: Psychological Clinic Press.
Subscription $1.50. 280 pages annually. Edited by Lightner Witmer.
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Training School Bulletin—Vineland, N. J.: The Training School.
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Monthly (10 numbers). Psychology and training of defectives.

Journal of Religious Psychology—Worcester, Mass.: Louis N. Wilson.
Subscription $3. 480 pages per vol. Founded 1904. Ed. by G. Stanley Hall
Published without fixed dates. 4 numbers constitute a volume.

Journal of Race Development—Worcester, Mass.: Louis N. Wilson.
Subscription $2. 460 pages annually. Founded 1910.
Quarterly. Edited by George H. Blakeslee and G. Stanley Hall.

Journal of Educational Psychology—Baltimore: Warwick & York.
Subscription $3. 600 pages annually. Founded 1910.
Monthly (10 numbers). Managing Editor, J. Carleton Bell.
(Educational Psychology Monographs. Edited by Guy M. Whipple.
Published separately at varying prices. Same publishers.)

Journal of Animal Behavior—Cambridge, Mass.: Emerson Hall.
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Bi-monthly. Robert M. Yerkes, Managing Editor.

The Behavior Monographs—Cambridge, Mass.: Emerson Hall.
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Quarterly. Founded 1913. Ed. by W. A. White and S. E. Jelliffe.

Journal of Experimental Psychology—Princeton, N. J.
Psychological Review Company. 480 pages annually. Experimental.
Subscription $3.25. Founded 1916. Bi-monthly. Ed. by John B. Watson

Journal of Applied Psychology—Worcester, Mass.: Florence Chandler.
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Edited by G. Stanley Hall, John Wallace Baird and L. R. Geissler.

Psychobiology—Baltimore: Williams and Wilkins Company.
Subscription $5. 500-500 pages per volume. Bi-monthly.
Edited by Knight Dunlap. Founded 1917.